

PCT/EP03/11853

COMPRESSOR MACHINE WITH TWO  
ROTORS ROTATING IN OPPOSITE DIRECTIONS

The present invention relates to a compressor machine comprising two rotors rotating in opposite directions, which are fitted to two parallel, spaced apart shafts mounted in a housing, one of the shafts being driven directly and the other by intermeshing toothed gears mounted on the shafts.

Compressor machines with two rotors rotating in opposite directions can operate as compressors or vacuum pumps. EP 1 163 450 A1 discloses a machine of this type, having claw-type rotor blades, which is adapted to generate both suction air and blown air and is particularly suitable for use in the field of paper processing. The internal compression of machines of this type allows to attain markedly higher pressure ratios than for instance by means of a Roots pump. The cantilevered arrangement of the rotors in a pot-shaped housing results in a simple structure. However, the gear that couples the two shafts, on the one hand, and the shaft mounting, on the other hand, are disposed in separate housing parts which need to be exactly aligned with each other and pinned together. Similarly, the pot-shaped housing accommodating the rotors needs to be precisely pinned together with the gear casing. This results in the requirement of having to machine pin holes from two different sides of a housing part as precisely as possible. Any imprecision will lead to slanting shafts and thereby to increased bearing loads, toothed gear noises, and other malfunctions.

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The invention provides a compressor machine which ensures a precise orientation of the shafts in spite of a simplified manufacturing and a reduced number of parts. The compressor machine according to the invention has two rotors rotating in opposite directions, which are fitted to two parallel, spaced apart shafts mounted in a housing. One of the shafts is driven directly and the other by intermeshing toothed gears mounted on the shafts. The housing has two radial walls which are configured in one piece with each other and with a peripheral wall

US 2,635,552 A discloses a rotary pump for pumping liquids, mainly food or beverages. The pump comprises two parallel shafts each of which has a rotor cantilever-mounted thereto. The pump includes a gear casing having a gear chamber to receive toothed gears and a working casing that is bolted to the gear casing and has a working chamber to receive the rotors. The shafts are mounted in the end walls of the gear casing.

US 1,386,792 A discloses a rotary blower comprising a casing and two parallel shafts each of which has a rotor secured thereto. Arranged in the casing are a working chamber, a gear chamber and an air chamber therebetween. On one side thereof, the working chamber is delimited by a radial cover. The shafts are mounted in an outer wall on the end face delimiting the gear chamber and in the radial cover.

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and in which the shafts are mounted. The toothed gears are arranged between these radial walls. A side wall of the housing has an opening sealed by a removable cover. With the cover removed, the toothed gears can be fitted to the shafts through these openings. The bearing bores for the shafts can be produced  
5 and machined in the one-piece housing in a single set-up, so that, with a minimum number of parts involved, any causes of alignment errors are avoided. The cover sealing the opening in the side wall of the housing does not in any way affect the mounting of the shafts. The cover is a simple part which is merely required to close the opening and seal it against any escape of oil. It has turned out that this  
10 allows to avoid even minor positional inaccuracies, resulting in an improved efficiency and reduced running noises.

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Further features and advantages of the invention will be apparent from the following description of a preferred embodiment and from the accompanying drawings, in which:

- 15 - Figure 1 shows a side view of a compressor machine;
- Figure 2 shows an axial section of the compressor machine;
- Figure 3 shows a perspective view of a one-piece housing body of the compressor machine;
- Figure 4 shows three sketches to illustrate an internal compression;
- 20 - Figure 5 shows an enlarged detail view of a shaft seal; and
- Figure 6 shows an axial section of an alternative embodiment of the compressor machine.

The compressor machine described by way of example below includes rotors having claw-type rotor blades and may be operated both as a compressor and as a  
25 vacuum pump.

A pedestal 10 mounts an integral housing body 12 having a flange-mounted electric motor 14. The housing body 12 has two radial, parallel and spaced apart

In the compressor machine according to the invention, one of the radial walls is a radial outer wall and the other is an intermediate wall which on one side thereof defines together with the radial outer wall a gear chamber receiving the toothed gears and on the other side thereof defines a working chamber receiving the rotors. The compressor machine according to the invention is characterized in that on the end face facing away from the intermediate wall, the working chamber is sealed by a radial housing cover; the housing constitutes a monobloc base body having an opening at its face end facing the housing cover having a width that is the largest among all axial passages and bore holes located inside the housing, making them accessible for machining through this opening in one set-up of the base body; and the intermediate wall for its part has axial through openings for accommodating shaft bearings having a width larger than that of the axial bearing bores in the radial outer wall.

New Claims

1. A compressor machine comprising two rotors (26, 28) rotating in opposite directions, which are fitted to two parallel, spaced apart shafts (30, 32) mounted in a housing (12), one of the shafts being driven directly and the other by  
5 intermeshing toothed gears (34, 36) mounted on the shafts,

- the housing (12) including two radial walls (16, 18) which are configured in one piece with each other and with a peripheral wall and in which the shafts (30, 32) are mounted and between which the toothed gears (34, 36) are arranged, and a side wall having an opening (38) sealed by a removable lateral cover (40), and
- 10 - one of the radial walls being a radial outer wall (16) and the other an intermediate wall (18) which on one side thereof defines together with the radial outer wall a gear chamber (22) receiving the toothed gears and on the other side thereof defines a working chamber (24) receiving the rotors (26, 28),

**characterized in that**

- 15 - on the end face facing away from the intermediate wall (18), the working chamber (24) is sealed by a radial housing cover (44);
- the housing (12) constitutes a monobloc base body having an opening at its face end facing the housing cover (44) having a width that is the largest among all axial passages and bore holes located inside the housing (12), making them  
20 accessible for machining through this opening in one set-up of the base body; and
- the intermediate wall (18) for its part has axial through openings for accommodating shaft bearings having a width larger than that of the axial bearing bores in the radial outer wall (16).

2. The compressor machine according to claim 1, characterized in that the  
25 rotors (26, 28) are cantilever-mounted on the shafts (30, 32).

3. The compressor machine according to claim 1 or 2, characterized in that on the end face facing away from the intermediate wall (18), the working chamber (24) is sealed by a housing cover (44) having an outlet port formed therein which upon rotation of the rotors (26, 28) is exposed subsequent to a phase of internal compression and is closed by the end face of one of the rotors during an inlet phase.
4. The compressor machine according to any of the preceding claims, characterized in that a bearing cover plate (42) is applied to the intermediate wall (18) on the side of the rotors.
5. The compressor machine according to claim 4, characterized in that the bearing cover plate (42) has recesses for receiving shaft seals.
6. The compressor machine according to any of the preceding claims, characterized in that connected to the radial housing cover (44) is a hood (70) enclosing a fan.
7. The compressor machine according to any of claims 1 to 5, characterized in that the peripheral wall of the housing (12) is surrounded by a hood (70) defining axial cooling air ducts (72) together with the peripheral wall, the cooling air ducts (72) extending from the end face adjacent to the housing cover (44) up to a fan arranged on a driving shaft on the side of the gear chamber (22) facing away from the working chamber (24).